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09/926,186	01/14/2002	Masashi Kawasaki	HASH0012UPCTUS	2809

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EXAMINER

HU, SHOUXIANG

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 06/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/926,186

Applicant(s)

KAWASAKI ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 March 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 11-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 November 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5, 9, 11.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of claims 11-15, 17-23 and 31 in Paper No. 12 is acknowledged. After reconsideration, in view of the newly submitted/amended claims and newly submitted references in the ISD of Paper No. 11, the restriction requirement set forth in the previous Office action is hereby withdrawn.

Accordingly, claims 11-31 are pending in this application and remain active in this Office action.

### ***Drawings***

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the subject matters that the recited B in the recited formula  $\text{ScBMgO}_4$  or  $\text{ScBBBeO}_4$  is boron, as recited in claims 31 and 16, and/or that an insulating layer formed by using a material identical to that for the substrate for a basic structure, as recited in claims 20 and 27, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

***Specification***

3. The disclosure is objected to because of the following informalities and/or defects:

On page 14, line 9, the term of "17" should read as: --18--.

Appropriate correction is required.

***Claim Objections***

4. Claims 11-31 are objected to because of the following informalities and/or defects:

In claims 11 and 31, the term of "formed form" should read as: --formed from--.

In claims 21 and 28, the term of "a different channel type" should read as: --a different conductive type--.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 31, 16 and 20-30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably

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convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 31 and 16 each recite the subject matter that the recited B in the recited formula  $\text{ScBMgO}_4$  or  $\text{ScBBeO}_4$  is boron, but the original specification and drawings lack an adequate description for it, especially the crystalline structure and/or lattice parameters for it.

In addition, claims 20 and 27 each recite the subject matter of an insulating layer formed by using a material identical to that for the substrate for a basic structure, but the original specification and drawings lack an adequate description for it, especially its position and functionality.

Furthermore, claims 21, 22, 28 and 29 recite the subject matter that a light emission layer and/or a second semiconductor layer have/has a composition or a structure identical to that of the semiconductor layer as a base. However, according to the original specification and drawings, particularly see Fig. 14, the light emission layer (41) and the second semiconductor layer (42) each have a different composition (different doping) and a different structure from that of the semiconductor layer (43) as a base.

And, the original specification and drawings also lack an adequate description for a light emitting device having a nitride semiconductor base layer with a ZnO buffer layer as recited in claim 25, or with a ZnO light emitting active layer as recited and/or implied in claims 28-29. The original specification and drawings also lack an adequate description for a filter formed of a GaN layer, as recited in claim 30.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 18, 19, 23-26, 29 and 30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 18, 19, 23, 25, 26 and 30 recite the subject matter of an insulating semiconductor; however, an insulating material and a semiconductor material are two different types of materials, and a material can not be both insulative and semiconductive simultaneously. In the instant case, the ZnO can either be an insulator (if extremely purified) or a semiconductor (normally it always tends to be), but can be both of them at the same time.

Moreover, claims 24-25 and 29 recite and/or imply that the semiconductor layer is formed of ZnO, but it is already specified in claim 16 that it is formed of a nitride.

### ***Claim Rejections - 35 USC § 102***

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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10. Claims 31, 11-16, 20, 27 and 28, insofar as being in compliance with 35 U.S.C. 112 and as being best understood in view of the claim objections set forth above, are rejected under 35 U.S.C. 102(e) as being anticipated by Vaudo et al. ("Vaudo"; US 6,156,581).

Vaudo discloses a semiconductor device (See Fig. 3, also see col. 6, lines 18-49), comprising: a substrate (102; ScAlMgO<sub>4</sub>); a semiconductor layer (either layer 104 of GaN or ZnO (see col. 6, lines 40-49)); and a light emission layer (108; InGaN) and a second semiconductor layer (110; GaN) both having a lattice structure substantially identical to the base semiconductor layer (104).

Regarding claims 20 and 27, the upper portion of the ScAlMgO<sub>4</sub> substrate can be regarded as the recited insulating layer.

11. Claims 31, 16 and 24-29, insofar as being in compliance with 35 U.S.C. 112 and as being best understood in view of the claim objections set forth above, are rejected under 35 U.S.C. 102(e) as being anticipated by Brandle et al. ("Brandle"; US 5,530,267; of record).

Brandle discloses a semiconductor device (See Fig. 1, also see col. 4, lines 1-34, and col. 6, lines 31-37)), comprising: a substrate (12; ScAlMgO<sub>4</sub>); a semiconductor layer (14; GaN); a buffer layer (13, GaN); and a light emission layer (16; InGaN) and a second semiconductor layer (18; GaN) both having a lattice structure substantially identical to the base semiconductor layer (14).

Regarding claim 27, the upper portion of the  $\text{ScAlMgO}_4$  substrate can be regarded as the recited insulating layer.

***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 21, 22 and 29, insofar as being in compliance with 35 U.S.C. 112 and as being best understood in view of the claim objections set forth above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki'555 (EP 0 863 555 A2) in view of Vaudo et al. ("Vaudo"; US 6,156,581).

Kawasaki'555 discloses a semiconductor light emitting device (see Fig. 32), comprising: a substrate (11); a semiconductor layer (13; an Mg-doped ZnO, see page 7, line 25, and page 8, lines 29-45); a light emission layer (14; ZnO/MgZnO MQW); and a second semiconductor layer (15; an Mg-doped ZnO).

Although Kawasaki'555 does not expressly disclose that the substrate can also be  $\text{ScAlMgO}_4$ , one of ordinary skill in the art would readily recognize that ZnO and  $\text{ScAlMgO}_4$  have extremely matching lattices (see Table 1 in Kawasaki'555 and see col. 4, lines 33, in Brandle (US 5,530,267)), which normally would result in a high quality in the deposited ZnO layer, and that a ZnO layer can be readily deposited on a  $\text{ScAlMgO}_4$  substrate, as evidenced in Vaudo (see col. 6, lines 18-49).



Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the semiconductor device of Kawasaki'555 with the substrate being formed of ScAlMgO<sub>4</sub>, as taught in Vaudo, so that a semiconductor device with high quality in the semiconductor base layer would be obtained.

14. Claims 17-19, 23 and 30, insofar as being in compliance with 35 U.S.C. 112 and as being best understood in view of the claim objections set forth above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Koike et al. ("Koike"; Quasi-Microwave Band Longitudinally Coupled Surface Acoustic Wave Resonator Filters Using ZnO/Sapphire Substrate, JAP, V34, 1995, pp. 2678-2682; of record) in view of Vaudo et al. ("Vaudo"; US 6,156,581).

Koike discloses a filter device (see Fig. 3), comprising: a ZnO layer; a substrate (Sapphire); and input and output electrodes.

Although Koike does not expressly disclose that the substrate can also be ScAlMgO<sub>4</sub>, one of ordinary skill in the art would readily recognize that ZnO and ScAlMgO<sub>4</sub> have extremely matching lattices (see Table 1 in Kawasaki'555 and see col. 4, lines 33, in Brandle (US 5,530,267)), which normally would result in a high quality in the deposited ZnO layer, and that a ZnO layer can be readily deposited on a ScAlMgO<sub>4</sub> substrate, as evidenced in Vaudo (see col. 6, lines 18-49).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the filter device of Koike with the substrate being

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formed of  $\text{ScAlMgO}_4$ , as taught in Vaudo, so that a filter device with high quality in the ZnO layer would be obtained.

Regarding claims 17-19, the lower portion of the ZnO layer in Koike can be regarded as the buffer layer recited in claims 17 and 18, since the ZnO layer in the filter device of Koike would be naturally substantially insulative; otherwise the input and output electrodes therein would be substantially shortened.


### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is (703) 306-5729. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

SH  
June 10, 2003

  
Shouxiang Hu  
Patent Examiner